

FRESHWATER OSTRACODS FROM THE BATHONIAN OF OXFORDSHIRE

by R. H. BATE

ABSTRACT. Eight species of freshwater ostracod are described from the Bathonian of Oxfordshire as exposed in the Old Cement Quarry, Kirtlington, near Oxford. Because of the number of specimens available only two, *Timiriasevia mackerrowi* sp. nov. and *Theriosynoecum kirtlingtonense* sp. nov., are identified specifically. Other genera represented are:—*Bisulcoocypris*; *Darwinula*; and *Limnocythere*. The presence of these freshwater ostracods in marine sediments and associated with marine ostracods is considered to be due to their being brought into the area by rivers. The occurrence of two species of *Timiriasevia* from this country is the first recorded identification of the genus outside the U.S.S.R.

DURING an excursion organized by the Palaeontological Association and led by Dr. W. S. McKerrow to the Oxford district in 1958, the marine marls and limestones of Bathonian age were examined in the Old Cement Quarry, Kirtlington (Grid Reference SP/495200). The presence of freshwater ostracods associated with an otherwise marine fauna led to a more detailed sampling the following year. Whilst it is intended to describe the complete ostracod fauna in a subsequent publication the presence of this freshwater fauna is considered to be of sufficient importance to warrant its prior description here.

The Kirtlington quarry section has been previously described by Arkell (1931, p. 570 and 1947, p. 57) and need not be discussed in detail. The samples from which the ostracods are described were obtained from the *Fimbriata-waltoni* clay at the top of the Bladon Beds and from three horizons within the Wychwood Beds (see text-fig. 1). These beds are of Middle to Upper Bathonian age.

During Bathonian times the period of marine deposition in the Oxford area was greatly influenced by the land nearby. This is evidenced by the presence of abundant lignite, reptilian bones, and charophytes; all these being brought into the area by rivers draining the land surface. It is not surprising, therefore, that freshwater ostracods should be abundant at several horizons throughout the succession.

All specimens referred to in the text have been deposited in the collections of the Department of Palaeontology, British Museum (Natural History).

Acknowledgements. Dr. P. S. Ljubimova, V.N.I.G.R.I., Leningrad, U.S.S.R., and Dr. H. Oertli, S.N.P.A., Pau, France, kindly sent me material from their collections for comparison purposes. Their assistance in this way is gratefully acknowledged. Mr. S. H. Eagar printed the photographs taken by the author.

SYSTEMATIC DESCRIPTIONS

Subclass OSTRACODA Latreille 1806

Order PODOCOPIDA Müller 1894

Suborder PODOCOPINA Sars 1866

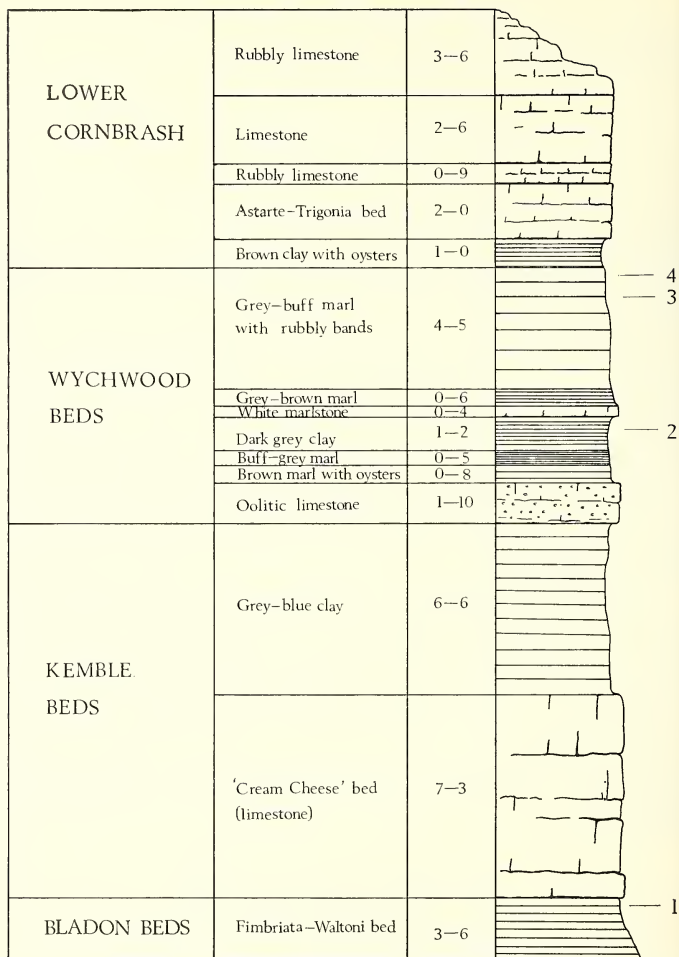
Superfamily DARWINULACEA Brady and Norman 1889

Family DARWINULIDAE Brady and Norman 1889

Genus DARWINULA Brady and Robertson 1885

Type species. *Polycheles stevensoni* Brady and Robertson 1870, by original designation.

[Palaeontology, Vol. 8, Part 4, 1965, pp. 749–59, pls. 109–11.]



TEXT-FIG. 1. Section of north-east face of Old Cement Quarry, Kirtlington, showing the four horizons from which fresh-water ostracods have been obtained.

Darwinula sp. A

Plate 109, figs. 1-4

Material. Two specimens (Io2715-16), a right valve from horizon no. 3 and a complete carapace from horizon no. 4.

Description. Carapace small, elongate-oval in outline with the greatest height and width in the posterior third. Greatest length passes through mid-point. Anterior narrowly rounded, posterior broadly rounded. Dorsal margin straight with convex antero-dorsal and postero-dorsal slopes. Ventral margin broadly incurved antero-medially. Left valve larger than the right which it overlaps strongly around the posterior and along the ventral margin. Hinge adont, consisting of a simple straight groove in the right valve. Other internal details not observed.

Dimensions. Carapace, BMNH Io2715, length 0.64 mm.; height 0.30 mm. Right valve BMNH Io2716, length 0.64 mm.; height 0.27 mm.

Remarks. Although close to *Darwinula leguminella* (Forbes in Lyell 1855, p. 294, text-fig. 334c) *Darwinula* sp. A may be distinguished by the more evenly rounded anterior margin, the line of greatest length passing through or slightly below mid-point. *D. leguminella* on the other hand has a more acuminate anterior margin, extended antero-ventrally so that the line of greatest length passes below mid-point. Until further material becomes available it is preferred to avoid giving the present series a specific name.

Superfamily CYTHERACEA Baird 1850

Family LIMNOCYTHERIDAE Klie 1938

Genus LIMNOCYTHERE Brady 1868

Type species. *Cythere inopinata* Baird 1843 by subsequent designation Brady and Norman 1889.

Limnocythere sp. A

Plate 109, figs. 8, 9

Material. A single left valve (Io2713) occurring at horizon no. 4.

Description. Valve subrectangular in outline with the ventral margin strongly concave and the greatest height situated in the posterior third. A deep, narrow, vertical sulcus is situated just anterior of mid-point. Greatest length of valve extends through mid-point. Anterior broadly rounded, posterior slightly more obliquely rounded. Dorsal margin long, slightly convex with prominent cardinal angles. The strong incurvature of the ventral margin is antero-median in position, the postero-ventral margin of the valve being strongly convex with a flat, distinct, marginal border. An oval swelling is situated just below and behind the vertical sulcus; posterior part of valve also prominently swollen. Shell surface granular, possibly originally punctate but now not clearly determinable because of preservation. Internally the lophodont type hinge consists of simple terminal sockets open ventrally to the inside of the valve, and a median element formed by the dorsal edge of the valve. Inner margin and line of concrescence coincide, duplication of moderate width. Muscle scars and radial pore canals not determined.

Dimensions. Left valve, BMNH Io2713, length 0.83 mm.; height 0.43 mm.

Remarks. *Limnocythere* sp. A appears to be close to *Limnocythere fragilis* Martin (1940, p. 348, pl. 7, figs. 105–9, pl. 9, fig. 152) in general appearance although it can be distinguished by the much stronger ventral incurvature and correspondingly more convex postero-ventral margin. The posterior is also more obliquely rounded in the present species which is further differentiated by the presence of a small oval swelling below and behind the vertical sulcus.

Limnocythere sp. B

Plate 109, figs. 5–7

Material. A single left valve (Io2714) found at horizon no. 2 in the Kirtlington section.

Description. Valve subrectangular with the greatest height in the anterior third. Greatest length through mid-point. Dorsal margin straight with prominent cardinal angles, the anterior angle in particular being noticeably upstanding. Ventral margin medially incurved. Anterior broadly rounded, posterior more narrowly rounded. Valve bi-sulcate with a median vertical sulcus and a shorter antero-median sulcus. Shell surface reticulate and rather irregularly swollen, giving a warty appearance. A short, pointed spine, backwardly projected, is situated below and slightly behind the median sulcus. Anterior and posterior margins flattened to form distinct marginal borders. Hinge lophodont, the terminal sockets being open to the interior of the valve. Median bar long and narrow. Inner margin and line of concrescence coincide, the duplicature being of moderate width. Radial pore canals long and straight, 8 anteriorly and 7 posteriorly. Muscle scars not observed.

Dimensions. Left valve, BMNH Io2714, length 0.83 mm.; height 0.44 mm.

Remarks. The ornamentation, warty appearance, and the presence of a ventro-lateral spine as well as the bi-sulcate development distinguish this species from all others previously described.

Genus *BISULCOCYPRIS* Pinto and Sanguinetti 1958

Type species. *Bisulcoypris pricei* Pinto and Sanguinetti 1958, by original designation.

Remarks. The genus *Bisulcoypris*, exclusively freshwater in habit, has a surface ornamentation consisting of pitting or reticulation with a tendency towards the development of small nodes or tubercles. Possibly the degree of tubercular development might reflect some variation in the environment (e.g. salinity or pH) although some species appear to be characteristically ornamented in this way. However, the development of nodes

EXPLANATION OF PLATE 109

All figures $\times 65$ unless otherwise stated.

- Figs. 1–4. *Darwinula* sp. A. Right, left, dorsal, and ventral views, complete carapace, Io2715.
 Figs. 5–7. *Limnocythere* sp. B. External and internal views (fig. 7, showing radial pore canals), left valve, Io2714.
 Figs. 8, 9. *Limnocythere* sp. A. External and internal views, left valve, Io2713.
 Figs. 10–12. *Bisulcoypris* sp. B. Internal view to show hinge, external view (ventral margin broken on this illustration) and internal view to show radial pore canals, left valve. Io2718.
 Figs. 13, 14. *Bisulcoypris* sp. A. Muscle scars and external view, broken right valve, Io2717. Fig. 13, $\times 170$.



1



3



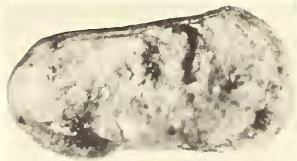
4



2



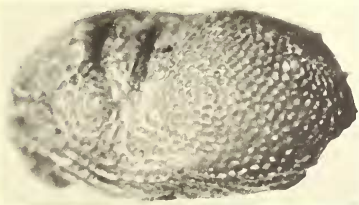
5



6



10



11



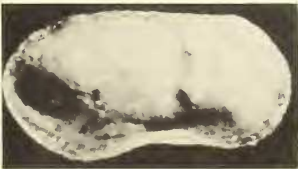
7



12



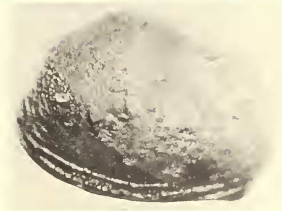
8



9



← 13



14

within *Bisulcoypris* is never carried to such an extent as is considered here to be found in *Theriosynoecum*. Of the number of species placed by Pinto and Sanguinetti (1962) into *Bisulcoypris* one, *B. fittoni* (Mantell), is tuberculate not only as an adult but also throughout its ontogeny (see Sohn and Anderson 1964) and is to be more accurately referred to *Theriosynoecum*. Both genera are freshwater in habit so there is no objection to this. Pinto and Sanguinetti's statement (p. 76, which will be discussed later) that *Theriosynoecum* is a marine genus is not accepted here.

The presence in the Kirtlington section of two species of *Bisulcoypris* and the occurrence of *B. tenuimarginata* (Oertli 1957, p. 765) in Bathonian sediments of Poitou, France, extends the range of this genus below that indicated by Pinto and Sanguinetti (p. 76).

As there is some confusion at the present time concerning the separate identity of the genera *Bisulcoypris* and *Theriosynoecum* it is relevant to state here that only strongly tuberculate species (throughout their ontogeny) are considered to belong to *Theriosynoecum* irrespective of the possession or absence of an accommodation groove. There appears to be no real justification for their separation on any other grounds.

Bisulcoypris sp. A

Plate 109, figs. 13, 14

Remarks. A broken right valve (Io2717) from horizon no. 1 is all that has been found of this particular species. Shell surface is strongly punctate with longitudinal ridges developed along the ventral and ventro-lateral surfaces.

Bisulcoypris sp. B

Plate 109, figs. 10-12

Material. Two left valves (Io2718-19) occurring at horizon no. 4.

Description. Valve subquadrate in outline with the greatest length passing through mid-point and the greatest height in the posterior third. Anterior and posterior broadly rounded. Ventro-lateral margin convex, overhanging the ventral surface. Ventral margin with shallow antero-medial incurvature; dorsal margin strongly concave medially with broadly rounded anterior cardinal angle and sharply acute posterior angle. Posterior part of valve strongly inflated, the inflation being obliquely angled below the posterior cardinal angle to leave a flattened area. Shell surface uniformly reticulate with a series of short spines and nodes. In both left valves a short spine is present on the posterior cardinal angle, two further spines occur on the upper part of the posterior and a number around the anterior margin where they are found just to the inside of the narrow marginal border. The area between the two antero-dorsal sulci is noticeably swollen and two low nodes occur in the anterior half of the valve. In the posterior half three low nodes may occur one above the other just behind the second of the two sulci. These are present, however, only on one of the two valves and in this case a prominent tubercle is also developed just above the line of greatest length and in front of the two posterior spines. Longitudinal striae extend along the ventral and ventro-lateral surfaces and around the posterior. Hinge lophodont, the posterior socket in the left valve being short and triangular in shape whilst the anterior socket is elongate and rather narrow. Median bar

smooth, long, and strongly developed. An accommodation groove is present only over the posterior half of the hinge. Inner margin and line of concrescence do not coincide around the anterior margin where a narrow vestibule is developed. Radial pore canals (approximately 30 anteriorly) short, straight, and rather slender, posterior canals not seen. A narrow flange extends, outside the selvage, around the free margin from the anterior to the posterior cardinal angle. Muscle scars not observed.

Dimensions. Left valve, BMNH Io2718, length 1.03 mm.; height 0.63 mm.

Remarks. It is impossible to contrast sp. *A* and sp. *B* on the amount of material available but it would appear that in the case of sp. *B* the ornamentation is reticulate rather than punctate with the tendency to develop small tubercles, the two sulci are also separated by a distinct swelling. In sp. *A* the area between the sulci is flattened. *Bisulcoypris tenuimarginata* (Oertli 1957, p. 765, pl. 23, figs. 15–24) is a much smaller, compact ostracod, showing no tendency to develop small nodes.

Genus *THERIOSYNOECUM* Branson 1936

Type species. *Morrisonia wyomingensis* Branson 1935, by monotypy.

Remarks. The genus *Theriosynoecum* was originally described from Wyoming, U.S.A., under the preoccupied name of *Morrisonia* by Branson from freshwater sediments of the Morrison formation.

Pinto and Sanguinetti (1962, p. 76) suggest that *Theriosynoecum* is a marine ostracod because of its association with marine forms in Bathonian and Callovian sediments of England. A few years ago when Professor Pinto was visiting this country he examined my material from Kirtlington, where the association of this ostracod with marine ostracods is beyond dispute. However, when the complete evidence, both stratigraphical and palaeontological, is taken into consideration it can be seen that the presence of *Theriosynoecum*, as well as specimens of *Darwinula*, *Bisulcoypris*, and *Timiriasevia*, in marine sediments at Kirtlington is due entirely to their being brought into the area by rivers.

Theriosynoecum kirtlingtonense sp. nov.

Plate 110, figs. 1–11, Plate 111, fig. 1

Material. Fourteen specimens (Io2720–33) from horizons nos. 1–4.

Diagnosis. Carapace rectangular with well-rounded anterior and posterior margins. Posterior cardinal angle acute, anterior angle rounded. Shell surface strongly reticulate anteriorly, generally weakly reticulate posteriorly. Vento-lateral margin projected as thinly developed ridge, particularly postero-laterally. 8 strong tubercles are developed in

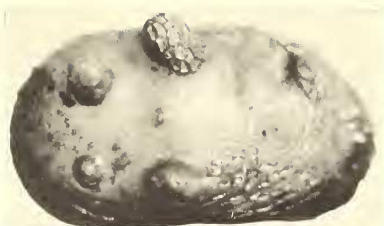
EXPLANATION OF PLATE 110

All figures $\times 65$ unless otherwise stated.

Figs. 1–11. *Theriosynoecum kirtlingtonense* sp. nov. Figs. 1–3, 11. External, internal, and dorsal views and internal view ($\times 110$) to show anterior radial pore canals, male left valve, holotype Io2720. Figs. 4–7. External, internal, dorsal, and ventral views male right valve, paratype Io2726. Figs. 8, 9. External and internal views, female right valve, paratype Io2725. Fig. 10. Muscle scars ($\times 120$), female right valve, paratype Io2730.



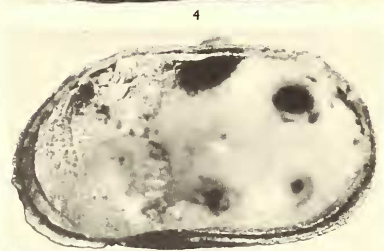
1



4



2



5



3

6

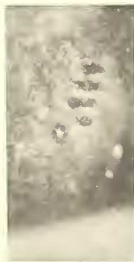
7



8



9



10



11

both male and female dimorphs, 3 in the anterior half and 5 in the posterior half. Small additional nodes may be present close to the anterior and posterior margins and at the posterior cardinal angle. A narrow anterior vestibule is present. Radial pore canals short, thin, and numerous, approximately 27 anteriorly. Muscle scars an oblique row of 4 oval scars, no anterior scars observed.

Holotype. A male left valve BMNH Io2720, from horizon no. 4.

Description. Carapace bi-sulcate, oval-rectangular in outline with well-rounded anterior and posterior margins. Dorsal margin slightly convex in the left valve, the outline being broken posteriorly by the development of an accommodation groove, medially concave in the right valve. Ventral margin with a broad median incurvature. Ventro-lateral margin projected ventrally, overhanging the ventral surface in side view, particularly well developed postero-laterally. Cardinal angles prominent with the posterior angle of the left valve being particularly acute, and possessing a short spine. Sexual dimorphism strongly apparent, the females being quite swollen posteriorly. Greatest length of carapace through mid-point, greatest height in the male dimorph either in the anterior or the posterior third, in the female dimorph the greatest height occurs in the posterior third. Although a complete carapace has not been found the greatest width would be in the posterior third. A flattened marginal border extends round the anterior. Carapace strongly tuberculate, possessing a maximum of 8 tubercles, one of which separates the two antero-dorsal sulci. This oval tubercle may, however, be missing, in which case the two sulci fuse to form a single broad depression. In front of the short anterior sulcus a low oval tubercle is developed just below the anterior cardinal angle. A second rounded tubercle occurs just below this anterior sulcus. Behind the second of the two sulci 5 tubercles may be developed. In position there is a vertical row of 3 tubercles immediately behind the sulcus and of these the dorsal and ventral ones are the most strongly developed, being directed to the rear. The median tubercle is often found out of position, further towards the posterior, or may be missing altogether. Two prominent tubercles are situated further back on the posterior part of the valve and again are situated one above the other. Shell surface is reticulate but often only in the anterior half, the ornamentation fading away towards the posterior. In some specimens, however, the reticulation is present over the whole of the valve, and in all specimens continues over the tubercles. Young instars show the same number and positioning of the tubercles. Ventral and underside of ventro-lateral surface strongly ornamented with about 4 longitudinal ridges. Particularly in the females further ridges may also be present on the ventro-lateral surface and around the posterior. Hinge lophodont: left valve with smooth terminal sockets of which the posterior socket is triangular in shape and the anterior socket is more elongate. Median bar long, smooth, and strongly developed. Above the median element an accommodation groove is developed in the posterior half of the valve only. Right valve with a terminal blade-like tooth and a smooth median groove which follows the outline of the dorsal margin by bending downwards medially and is most broadly developed in the anterior half. Inner margin and line of concrescence coincide except for around the anterior margin where medially a narrow vestibule is apparent. Radial pore canals numerous, short, and straight, approximately 27 in number anteriorly. Occasionally the canals can be seen to occur in pairs diverging towards the outer margin. Selvage prominent with a well-developed flange outside. This flange